DOCUMENT RESUME

ED 044 821 FA 003 175

AUTHOR Cruze, Alvin M.
TITLE Long Range Planning for the North Carolina Community College System.
PUB DATE Oct 70
NOTE 39p.: Paper presented at Operations Research Society of America National Meeting (38th, Detroit, Michigan, October 28-30, 1970)

EDRS PRICE EDRS Price MF-$0.25 HC-$2.05
DESCRIPTORS Budgeting, *Community Colleges, Educational Needs, Enrollment Projections, Labor Market, Management Systems, *Planning, State Departments of Education, Vocational Education
IDENTIFIERS *North Carolina

ABSTRACT

To assist the North Carolina community college system fulfill its role more effectively in a rapidly changing economy, a long-range plan was prepared to provide direction for the whole system as well as for each individual institution. The 10-year plan ensures orderly and effective preparation for (1) educational and training programs; (2) construction of facilities; (3) acquisition of equipment, staff, and faculty; and (4) financing to provide adequate and coordinated assistance to the overall development of the state's manpower resources. This paper describes the plan and the process by which it was derived. (Author)

ED 044821

LONG RANGE PLANNING

FOR THE

NORTH CAROLINA COMMUNITY COLLEGE SYSTEM

Alvin M. Cruze

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Presented at

38th National Meeting

of the

Operations Research Society of America

October 28-30, 1970

EA 003 175

ED044821

Long Range Planning for the North Carolina Community College System

Alvin M. Cruze
Department of Economics
University of North Carolina
Chapel Hill, North Carolina*

I. INTRODUCTION

A. Need for Planning

The Comprehensive Community College System of North Carolina was established in 1963.[1/] The present (1970-71) system consists of the State Board of Education, which provides policies, regulations and standards, the Department of Community Colleges, which implements and administers the policies, regulations and standards of the board and coordinates the work of the institutions, and 54 institutions throughout the state which provide the education and training programs. The first seven years of the system's existence have been devoted primarily to the creation and initial functioning of the 54 institutions--15 community colleges and 39 technical institutes.

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* The study on which this paper is based was directed for the North Carolina Community College System by the author while he was a staff member of the Research Triangle Institute, Research Triangle Park, North Carolina. The study was financed, in part, by the Coastal Plains Regional Commission.

1/ This title is shortened in the remainder of this paper to either community college system or, more simply, system.

In order for the community college system to fulfill its role more effectively in the rapidly changing North Carolina economy, its decision-makers must be provided with the information needed for the effective and efficient allocation of the resources at their disposal. This information can only be obtained as the output of a carefully designed planning process. The planning process and the resulting plans should estimate the future needs for the types of training provided by the institutions in the system, needs which are derived from the projected growth of the North Carolina economy. In addition the estimated costs and benefits of providing training in the various programs of the system should be provided in order to guide the allocation of resources among these programs in the future.

B. Scope of this Paper

In order to prepare adequately for the challenge of the future a long-range plan has been prepared to assist in providing direction for the community college system as a whole and for each individual institution. The plan covers a period of ten years to ensure orderly preparation for educational and training programs, for construction of facilities, for acquisition of equipment, staff and faculty, and for financing to provide effective and coordinated assistance to the overall development of the manpower resources of the state. The long-range or strategic plan and the process by which it was derived are presented in this paper.

The concept for long-range planning has been developed in a format that lends itself to the preparation of shorter-range, operational plans. The shorter-range plans which have been developed are (1) a four-year operating plan and (2) a two-year model budget. Each of these two plans, which have been prepared in greater detail for the system as a whole and with little input from local institutions, will serve as an information

source to the necessary process of preparing similar plans at the local level. It is only through the process of the provision of planning guidance and information at the state level supplemented by necessary inputs from the local level that an effective planning capability for the community college system can be realized.

The results of this initial planning activity have been published in four volumes. The first presents a summary of the overall effort and contains recommendations for implementation of an effective planning capability within the community college system. The three statewide plans for the system are documented in the remaining three volumes as follows: Volume II - Ten-Year Strategic Plan; Volume III - Four-Year Operating Plan; and Volume IV - Two-Year Model Budget.[2/] Persons interested in the complete planning study may obtain copies of each of these volumes from the Education Research Information Center (ERIC).

II. COMMUNITY COLLEGE SYSTEM PLANNING PROCESS

A. General

Planning, with its many semantic uses, is a general term which must be defined more precisely for application to the community college system. It is defined here as the process of deciding the actions to be implemented to realize some future goal in a future environment given today's position in today's environment. According to the definition, the requirements of the process are: knowledge of today's position and environment, projection of tomorrow's environment and selection of a goal(s).

2/ Planning for the North Carolina Community College System, Volumes I-IV, Raleigh, North Carolina: Department of Community Colleges, June 1970.

"Planning" and "control" are two terms used for the same basic process and to attempt to discuss the two separately would be artificial and would lessen rather than add to the understanding of this analysis. The terms will be used interchangeably in the following discussion with the term used dictated by the emphasis that is desired.

Several analytic frameworks for planning have been developed. However the framework provided by Anthony has been selected because of its generality, conciseness and appropriateness for this analysis. Anthony's framework recognizes three elements of the planning process:

> Strategic planning is the process of deciding on goals of the organization, on changes in these goals, on the resources used to attain these goals, and on the policies that are to govern the acquisition, use and disposition of these resources.
>
> Management control is the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of organizational goals.
>
> Operational control is the process of assuring that specific tasks are carried out effectively and efficiently.[3/]

Although this paper focuses on the strategic element of the planning process, the other two elements are also discussed in this section to outline the complete scope of planning for the community college system.

Strategic planning comprises both choosing goals and planning how to achieve the desired goals. Each problem in strategic planning is different and the method of arriving at the solution varies. Furthermore, each problem is highly complex and has many variables (social, economic, political, technical, etc.) that must be considered. After the planning staff prepares possible solutions to the problem, higher authorities decide which alternative will satisfy best the basic decision criteria of the problem. The

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3/ R. N. Anthony, Planning and Control Systems, A Framework for Analysis Cambridge, Mass.: Graduate School of Business Administration, Harvard University, 1968, pp. 15-21.

end results are a set of policies and precedents operative within a time frame that tends to be long. During this planning effort a ten-year strategic plan was prepared to provide direction to the conduct of this element of the planning process.

The management control element is concerned with the ongoing administration of the organization and requires both planning and control; the one term--management control--is used since separation of the two would be artificial. Management control is performed in state government by agency and department heads who operate within the goals and policies derived from the strategic plan. Top management gets things done through other people and measures their performance by the effectiveness and efficiency with which the goals are attained. During the overall planning effort a four year operating plan was prepared to provide direction to the planning aspect of management control.

In contrast to management control which is concerned with individuals and their performance, operational control is task oriented. The tasks are specific and require little or no judgment for their execution. Furthermore, this element of the planning process occurs within a set of policies derived from both strategic planning and management control and usually has standards or targets against which the actual performance can be compared. By means of set rules an operational control system indicates what actions are to be taken to satisfy certain conditions. In essence this system makes decisions, whereas the strategic planning and management control elements only assist the decisionmaker.

An important instrument in the operational control element of the planning process is a budget, which serves as a detailed plan for the accomplishment of specific tasks over a short time frame (e.g. a fiscal

year) and also as an instrument for controlling financial accountability. During this effort a detailed model two-year budget for the system community college system has been prepared to provide direction to this element of the planning process.

B. Application to Community College System

An effective planning process for the community college system must necessarily include each of the three elements outlined by Anthony. In addition, because of the systems organizational structure, inputs from three levels--the State Board of Education, the Department of Community Colleges and the system's 54 institutions--are required. Finally, in order to adapt to the continuously changing environment in which the system operates, the plans formulated during execution of the planning process must be evaluated as their educational programs are realized and revised in order to incorporate additional information as it becomes available. A schematic diagram of the planning process for the community college system which depicts these necessary relationships and interactions is presented in Figure 1.

The basic input to the derivation of the three plans of the planning process is a comprehensive education needs analysis for the population of North Carolina. The result of this needs analysis is a listing of training needs of the community college system. Although detailed needs of other sectors of the state's educational system were not derived during this effort, the basic data to generate these needs are available in order to account for their linkages to the community college system.

The first step in the needs analysis is to specify the goals of the community college system. The determination of these goals, which is a requirement of strategic planning, also provides the necessary guidance to shorter-range planning. The description of the current system is

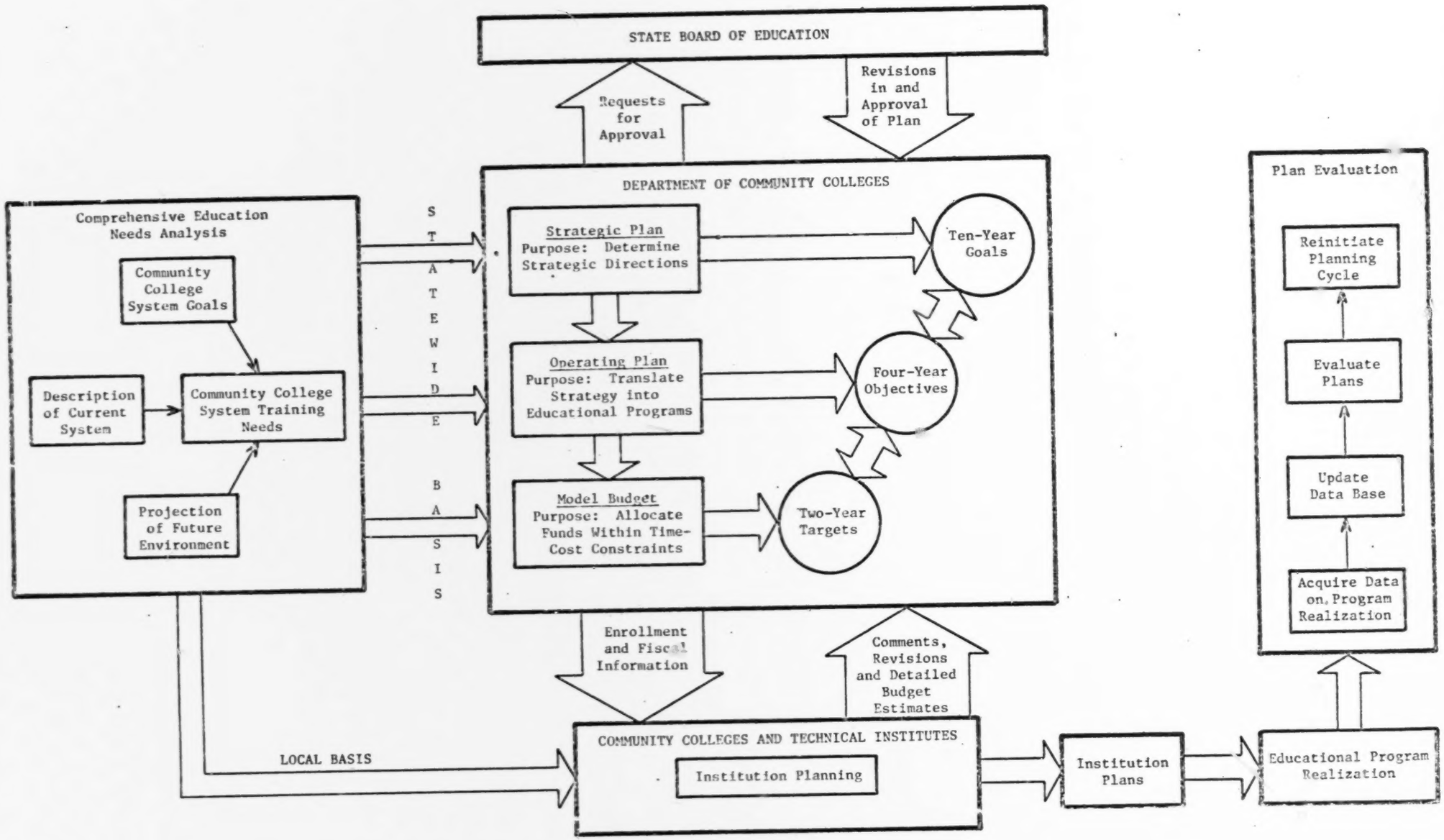

Figure I. NORTH CAROLINA COMMUNITY COLLEGE SYSTEM PLANNING PROCESS

designed to answer several important questions: "Where do we stand and by what path was this position reached? What are the current skills being employed in the economy of North Carolina and how do these differ from those utilized ten years ago? What are the present and past capabilities of the community college system and of other sectors of the state's educational system?"

The projection of the future environment extrapolates basic trends, assuming few major policy changes. As a result of this step in the needs analysis, answers are provided to such questions as "What will be the employment level in North Carolina in 1980? What will be the industrial and occupational distribution of this employment? What types of training will be required for entry into these occupations?" The training needs of the community college system are based on a simultaneous consideration of goals, description of current system and projection of future environment.

The strategic plan is the most general of the three plans and has been designed for a planning period of at least ten years. The purpose of this plan is to provide the long-range guidance required for the growth of each institution. In addition, the strategic plan serves as the basis for the two shorter-range plans, as the needs, objectives, and alternatives specified for each must be consistent with its results.

The decisions which depend on the strategic plan are those involved with a continuing effort toward the acquisition of relatively fixed inputs to the educational process over a lengthy time frame. Decisions in such a time horizon are those related to the acquisition of land, the development of facilities, and the purchase of expensive or critical items of equipment. Because of flexibility in the utilization of both staff and facilities over a long planning period, the strategic plan does not contain specific details of these requirements.

The strategic plan was initially formulated as a series of alternatives, each consisting of different educational program emphases which satisfied the ten year goals to varying degrees. A predictive model, which indicates what will happen in the future if a particular set of actions is undertaken, was used to evaluate the alternative plans. This model provides certain elements of information, primarily of an economic nature, upon which the recommendation of the implementation of a single plan was based. Additional variables of a social, political and technical nature were taken into consideration before specifying the final recommendation.

The roles of the State Board of Education and the community colleges and technical institutes in the planning process are also indicated in Figure 1. The board received a request for approval of the recommended plans from the Department of Community Colleges and, in turn, indicated its desired revisions and approved course of action to the department. The resulting approved statewide plans have been furnished to the local institutions to assist them in the preparation of their individual plans.

The institutions have received enrollment and fiscal information from the three statewide plans for use in the preparation of their plans. In addition, the institutions will conduct their own needs analysis on a local basis in order to insure that important characteristics of the local economy were not overlooked. Of particular importance in the local planning process is the statement of goals, since those specified by local institutions may exhibit different emphases across the state. During the planning process conducted at the local level, the institutions prepare comments, revisions and detailed budget estimates which are used to revise the statewide plans. The final output of the local planning process will be a set of 54 plans to guide the operations of each institution over the time horizons of ten, four and two years.

The next step in the planning process is the realization of the educational programs contained in the institutional plans. During this step the full implications of the management control and operational control elements of the planning process are realized. An appropriate evaluation system must be developed in order to insure that the goals, objectives and targets of the plan are accomplished. This process requires that particular attention be paid to careful specification of goals and objectives and the measurement of performance in light of these. As applied to the community college system, the present procedures for allocating biennial appropriations among the 54 institutions must be examined and revised as appropriate to assist in accomplishing the goals, objectives and targets of the three plans.

As the educational programs are realized, the plans on which they are based must also be evaluated. This step requires that data measuring the various aspects of program realization be acquired and used to update the planning data base. Once these data are acquired and analyses have been performed, the plans on which the educational programs are based can be evaluated. This evaluation provides an input to the reinitiation of the planning cycle, which begins anew with the comprehensive education needs analysis.

III. ANALYSIS OF COMMUNITY COLLEGE SYSTEM LONG RANGE TRAINING NEEDS

A. Goals

The long-range or strategic planning process of the community college system consists of the process of deciding on the goals of the system, on changes in these goals, on resources required to attain the goals, and on the policies that are to govern the acquisition, use and disposition of these resources. In contrast, short-range plans function within the organizational goals and policies and are more concerned with management and operational control of resources to fulfill a specified time-phased portion of the strategic plan.

For purposes of this planning effort, a goal is defined as a general purpose pursued over a long period of time which is usually not quantified. In contrast, objectives are set for specific, shorter time frames and are usually quantified. The primary criterion for selection of the goals is that they must be related to the contributions made to North Carolina's people and economy by the community college system's educational process and not to the educational process itself. The educational process then becomes the means for achieving the goals.

The number of goals selected should be as small as possible, consistent with the overall purpose and operations of the system. The reasons for this are twofold: (1) the educational programs of the system may contribute to more than on goal, necessitating the use of multiple measures of effectiveness in program evaluation. The use of a small number of goals keeps this evaluation process as uncomplicated as possible; (2) some of these goals may conflict. The use of a small number keeps these conflicts to a minimum. In addition, in order to formulate an effective strategic plan for implementation, priorities

must be determined among the goals. The specification of a relatively small number of goals simplifies the necessary task of setting these priorities.

The purpose of the North Carolina Community College System is to fill the gap in a broad range of educational opportunity between high school and the senior college and university. In carrying out this role, the system of technical institutes and community colleges offers occupational, academic and cultural education and training opportunities from basic education through the two-year college level, at a convenient time and place and at a minimal cost, to anyone of suitable age who can learn and whose needs can be met by the institutions within the system.

Consistent with this purpose the following goals have been established for the community college system:[4/]

1) To open the door of each institution to all persons of suitable age, who show an interest in and who can profit from the instruction offered, with no individual denied an educational opportunity because of race, sex or creed.

2) To provide a variety of quality post-secondary educational opportunities at less than baccalaureate level and consistent with the abilities, desires and needs of the students to fit them with the skills, competencies, knowledge and attitudes necessary in a competitive society.

3) To provide for industry, agriculture, business, government and service occupations the pre-service and in-service manpower training that requires less than baccalaureate level preparation.

4) To provide specific training programs designed to assist in fostering and inducing orderly accelerated economic growth in the state.

4/ These goals are based primarily on published policies and other statements of the community college system. A useful outline which was used to check the goals for completeness is contained in Arnold Kotz (ed.), Occupational Education: Planning and Programming, Volume II, Menlo Park, Calif.: Stanford Research Institute, September 1967.

5) To provide activities and learning opportunities which meet the adult educational and community service needs of the residents of the community served by an institution.

6) To direct the resources of the community college system toward a search for solutions to urgent community problems.

7) To provide, in both curriculum and non-curriculum programs, the education needed to assist individuals in developing social and economic competence and in achieving self-fulfillment.

B. Description of Community College System

Before discussing the methodology used to project the long-range training needs of the community college system, a description of the system's current activities is provided in order to assist in the interpretation of the projections. At the present time (1970-71) the community college system consists of 15 community colleges and 39 technical institutes throughout the state. Freshmen and sophomore levels of college transfer studies are available in the community colleges but are not provided in the technical institutes. In addition, each of the 54 institutions offers the following educational programs: occupational education (technical) -- two year programs to train technicians; occupational education (vocational) -- one year programs to train craftsmen; occupational extension programs -- short courses to retrain or upgrade employed persons; adult basic education -- basic education programs for persons with less than eight years of schooling; adult high school education -- programs to qualify adults for the high school diploma or certificate; general adult education -- short courses to serve avocational interests or requirements for general education of adults of community; new industry training -- special training programs for new or expanding industries in the institution's community and Manpower Development Training Act (MDTA) -- occupational and basic training for unemployed and disadvantaged persons.

Total enrollment in these programs for the 1968-69 academic year equalled 240,851 students. The distribution of this enrollment among the major educational programs is shown in the following table.

Table 1

COMMUNITY COLLEGE SYSTEM
ENROLLMENT DISTRIBUTION AMONG PROGRAMS, 1968 - 1969

Program	Unduplicated Headcount Enrollment	Percent
Curriculum		
College Transfer	12,243	5.1
Technical	19,016	7.9
Vocational	10,795	4.5
Total Curriculum	42,054	17.5
Extension		
Adult		
Adult Basic Education	22,542	9.4
Adult High School	18,728	7.7
Total Adult Extension	41,270	17.1
Occupational	86,146	35.8
General Adult	71,381	29.6
Total Other Extension	157,527	65.4
Total Extension	198,797	82.5
GRAND TOTAL	240,851	100.0

Financial support for the institutions of the system is provided from four sources: Federal government, state government, local (both private and public) and students. This support was distributed as follows for the 1967-68 fiscal year: State and Federal -- 84 percent; local -- 9 percent; and students --

7 percent. Equipment, library books and matching funds up to $500,000 for capital or permanent improvements are provided by the state, with additional capital funds provided to qualifying institutions through Federal acts. Salaries and travel of administrative and instructional personnel and the cost of supplies and materials are also paid by the state.

Acquisition of land and erection of buildings is a local responsibility beyond any assistance which may be provided by the state or Federal governments. Current expense involved in the operation and maintenance of the plant is also a local responsibility. Local funds may also be used to supplement any state budget item. Students pay nominal tuition charges for the curriculum programs and miscellaneous fees for the extension programs.

C. Projection Model

Effective planning for the future of the community college system must be undertaken with full consideration of the projected structure of the state's socioeconomic system. More specifically, the characteristics of the labor market in which graduates of the community college system will obtain employment are of primary importance to the planning process. The labor market must be described in terms of the occupational skills required for employment in agriculture, business and industry within the state and the types and extent of training required to provide a member of the labor force with these skil

Educational planning is as old as State education, but until comparatively recent times it has been more haphazard than deliberate, with very little in the way of systematic procedures. All of this was changed by events following the Second World War; the post-war explosion in the demand for education, the new interest in central economic planning, the obsession with growth rates in both developed and developing countries combined to promote a new attitude toward

the administration of education.

However, during this time period, no universally acceptable techniques have emerged to assist the educational planner in performing this necessary function. The fast-growing literature on the economics of education provides three different approaches to educational planning: (1) manpower requirements, (2) "social demand," and (3) rate of return analysis. Furthermore, in their present state of theoretical development, there is no logical reason for choosing one of these over the others as the "correct" approach.

In the manpower requirements approach, the expansion of the educational system is based on quantitative projections of the demand for highly qualified manpower. In the "social demand" approach, the private demand for education is projected as a function of its price and facilities are provided accordingly. Finally, in the rate of return approach, investments in education are made to the point of equalizing the yield of investment in human capital with that in physical capital.

Upon a review of the types of data presently available in North Carolina and in the rest of the United States and the assumptions underlying each of the three techniques for educational planning, it was decided to rely primarily on the manpower requirements approach for this effort. This technique has been widely utilized in educational planning efforts of the Organization for Economic Cooperation and Development (OECD) and has been utilized in several studies in this country.[5/]

5/ For a discussion of the role of manpower analysis in educational planning as practiced by OECD, see H. S. Parnes (ed.) Planning Education for Economic and Social Development, Paris: OECD, 1963. Examples of the use of this approach to educational planning in this country are Michigan Manpower Study, Columbus, Ohio: Battelle Memorial Institute, November 1966 and Manpower Directions in New York State, 1965-75, New York: New York State Department of Labor, March 1968. An excellent discussion of the strengths and weaknesses of each of the three approaches to educational planning is given by C. A. Anderson and M. J. Bowman, "Theoretical Considerations in Educational Planning," reprinted in M. Blaug (ed.), Economics of Education I, Baltimore: Penguin Books, Inc., 1968.

It should be emphasized that the analysis associated with the manpower requirements approach to educational planning is not the only set of considerations which should enter into the planning process. Obviously, the cultural and other aspects of education must be given a high level of importance, a fact recognized by the specification of the goals of the community college system. However, the appropriate data required to incorporate these aspects into the planning process were not available and could not be obtained within the time and funding constraints of this project.

The training needs for the community college system were calculated in two portions: (1) those estimated to exist in 1970 due to the fact that North Carolina workers have lower educational attainment levels than workers throughout the nation for the occupations in which they are employed and (2) those projected to occur throughout the 1970-1980 period. The procedures used to calculate these training needs are outlined in Figures 2 and 3.[6/] Basically these procedures consist of separate projections of the requirements and availabilities of manpower in the state and a reconciliation of these projections through educational attainment measured by years of schooling completed. In order to take into consideration differences in economic activity across North Carolina, the state was divided into ten planning areas with separate estimates of training needs for each.

The first step in calculating the training needs existing in 1970 was to estimate the 1970 occupational distribution of employment in each planning area. The degree of occupational detail employed was dictated by the occupational detail of county employment in North Carolina as reported in the 1960 Census of Population. Details of employment in twenty occupational groups are available in the census reports and were used for this effort.

6/ These diagrams have been adapted from the Battelle socioeconomic model reported in the Michigan Manpower Study.

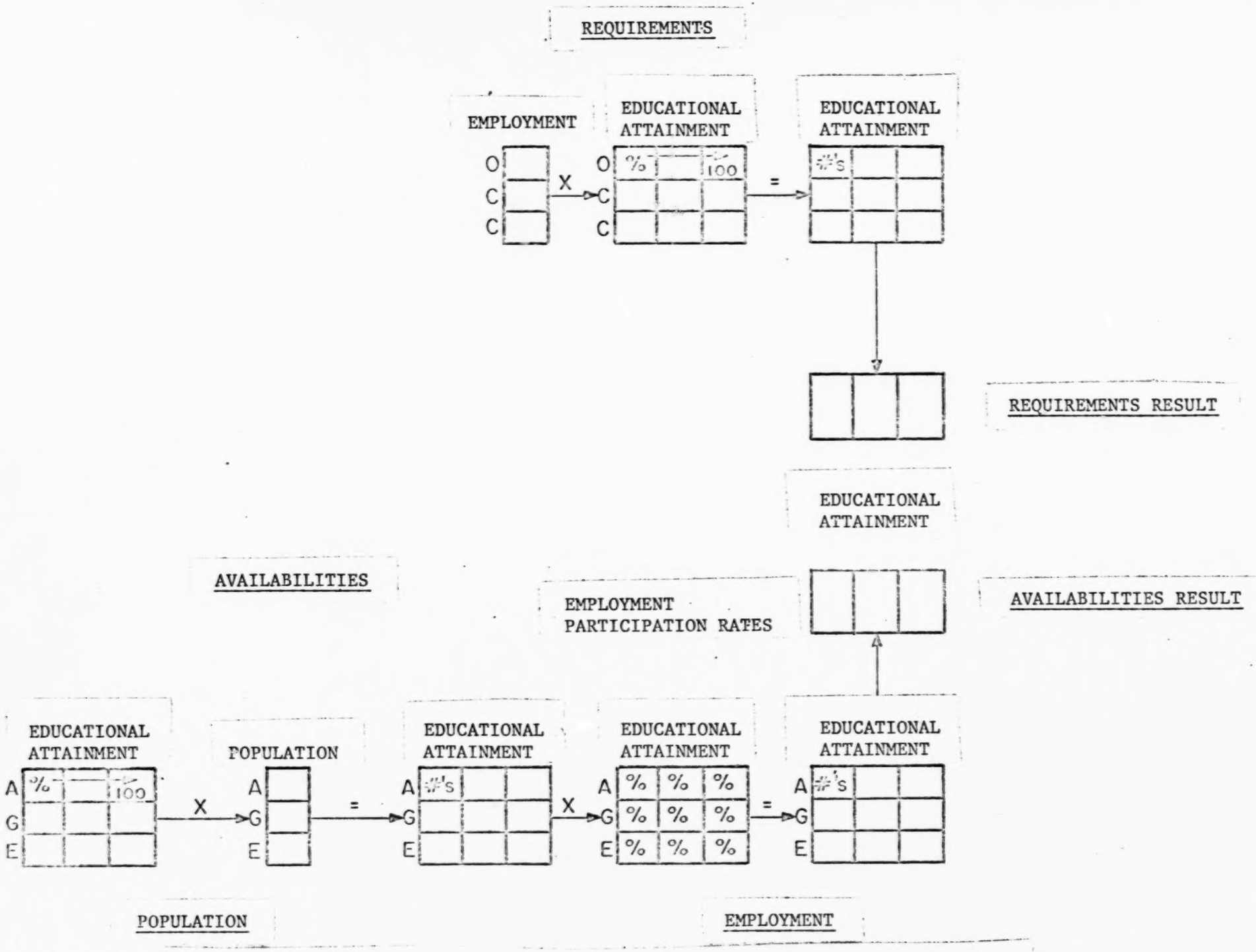

Fig. 2

DETERMINATION OF COMMUNITY COLLEGE SYSTEM TRAINING NEEDS EXISTING IN 1970

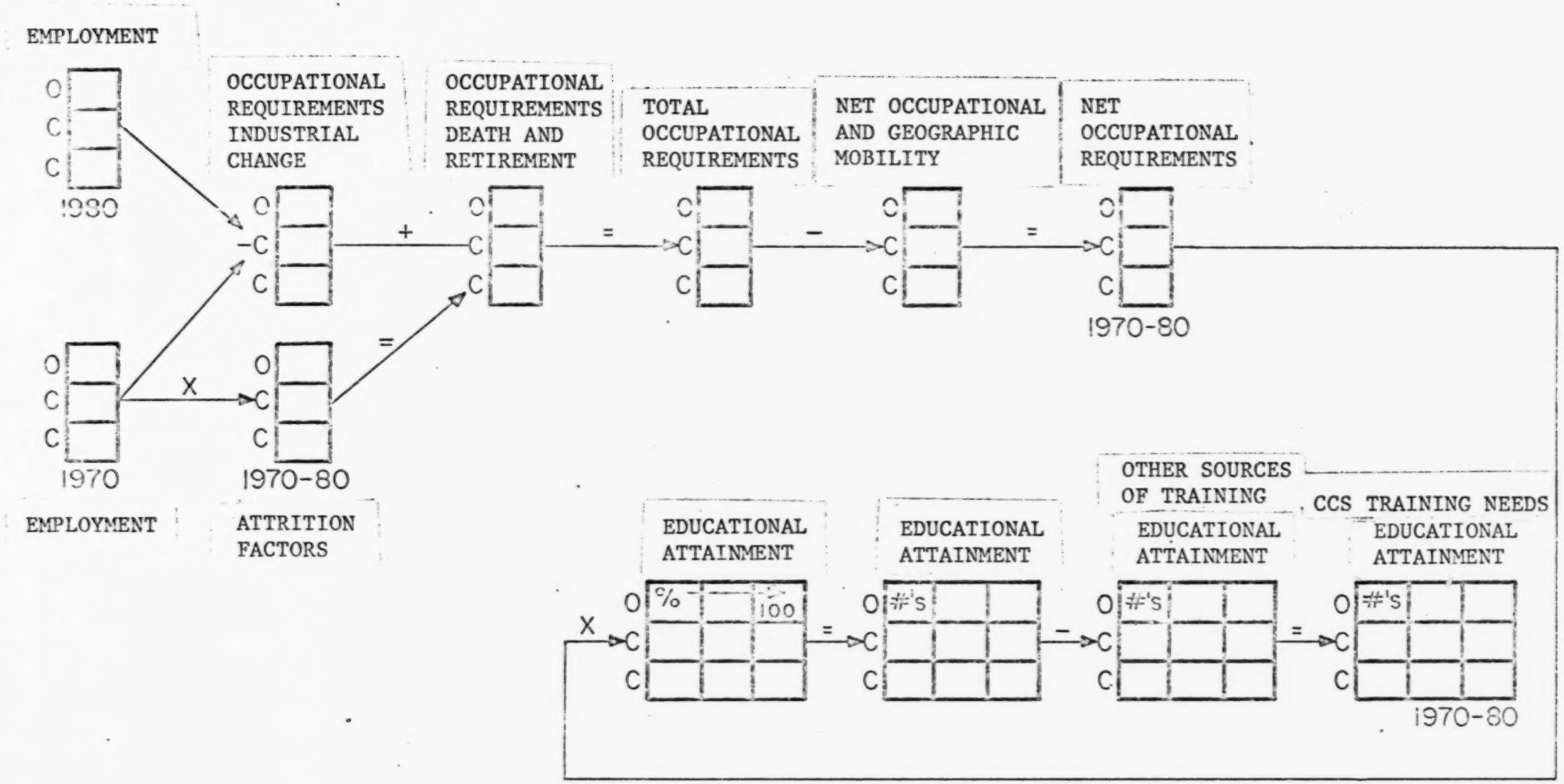

Fig. 3

DETERMINATION OF COMMUNITY COLLEGE SYSTEM TRAINING NEEDS 1970-80 DECADE

In order to estimate the 1970 occupational distribution of employment in each planning area, it is necessary to obtain estimates of the occupational distribution of employment for some base period, the industrial structure of employment in 1970 and trends in the occupational composition of employment in each industry. The occupational distribution of employment in each planning area was obtained for the base period (1960) from the U. S. Census of Population. Estimates of the industrial distribution of employment were obtained from 1970 projections provided by the Office of Business Economics (OBE) and from an analysis of recent employment trends in each planning area as reported by the Employment Security Commission of North Carolina.[7/] Trends in the occupational composition of employment by industry were obtained from the Bureau of Labor Statistics of the U. S. Department of Labor.[8/]

The technique used to estimate the occupational distribution of employment is Area Projection Method A as outlined in Volume I of Tomorrow's Manpower Needs. In general, estimates of each planning area's occupational distribution of employment were made by applying 1960 and estimated 1970 national industry-occupational patterns to the appropriate industry employment estimates for each year; summing the resulting occupational employment to area totals; computing the 1960 to 1970 change factors (percent change) for each occupation; and applying the change factors to separately estimated 1960 area employment totals. Mathematically, this procedure is expressed as follows:

$$L_j\,(70) = \frac{\sum_{i=1}^{n} f_{ij}\,(70)\,L_i\,(70)}{\sum_{i=1}^{n} f_{ij}\,(60)\,L_i\,(60)} L_j\,(60)$$

7/ The OBE projections were taken from U. S. Water Resources Council, Preliminary Report on Economic Projections for Selected Geographic Areas 1929 to 2020, Volume I. Washington: March 1968 (mimeo)

8/ U. S. Department of Labor, Bureau of Labor Statistics, Tomorrow's Manpower Needs, Bulletin No. 1606, Washington: U. S. Government Printing Office, February 1969.

where: L_i (year) is a total planning area employment in industry i in the given year

f_{ij} (year) is national fraction of occupation j in industry i in the given year

L_j (year) is total planning area employment in occupation j.

Occupational requirements were next calculated for each of six levels of educational attainment: 0-7 years of schooling, 8 years of schooling, 1-3 years of high school, high school graduate, 1-3 years of college and 4 or more years of college. The educational attainment distributions for workers in the 20 occupational groups were projected from national trends in educational attainment by occupation as reported in various special labor force reports of the Bureau of Labor Statistics of the U. S. Department of Labor. These data are obtained from the Current Population Survey administered by the U. S. Bureau of the Census.

As defined by the Census Bureau, the educational attainment category of a high school graduate receiving post-secondary technical and vocational training not designed for transfer to a baccalaureate degree in a four-year college remains at four years of high school. Therefore it was necessary to estimate the percent of the requirements for four years of high school in each of the occupational groups that require post-secondary training. This task was accomplished in the following manner.

The portion of requirements for four years of high school requiring post-secondary technical and vocational training was first estimated for each of the approximately 170 occupations tabulated in the 1960 Census of Population for North Carolina. These estimates were obtained by considering (1) national patterns of requirements by educational attainment category, (2) levels of general educational development and time period of specific

vocational preparation required for each of the occupations and (3) present patterns of curriculum offerings in the community college system and proprietary schools in North Carolina.[9/] Proportions of high school educational attainment requiring post-secondary education were estimated for each of the occupational groups by combining the fractions of post-secondary training requirements for each specific occupation within the group, using the 1960 distribution of occupations in North Carolina as weights.

Once the total post-secondary occupational training requirements were obtained, they were next divided into requirements for technical and vocational training. This task was accomplished by first designating the occupational groups for which graduates of each of the technical and vocational curricula are trained. Next a cross tabulation, listing the curricula providing graduates to each of the occupational groups was prepared. For cases in which only technical or only vocational curricula provided graduates, all of the requirements were assigned to the appropriate curriculum group; in cases where both technical and vocational curricula provided graduates to the occupational group, post-secondary training requirements were allocated to the two groups in proportion to Fall Quarter 1968 community college system

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9/ Levels of general educational development (GED) and specific vocational preparation (SVP) for each of the occupations have been determined by manpower specialists in the U. S. Department of Labor. GED is given in terms of six levels of reasoning ability required; SVP is given in nine intervals of time, ranging from short orientation to 4-10 years. A given level of GED for different occupations does not necessarily imply equal levels of schooling. SVP can be obtained through on the job training and experience, as well as through formal education. Despite these difficulties, these criteria were extremely useful in estimating the proportions of post-secondary training for each of the occupations. Information on GED and SVP requirements are contained in U. S. Department of Labor, Selected Characteristics of Occupations by Worker Traits and Physical Strength, Supplement 2 to the Dictionary of Occupational Titles, Third Edition, Washington: U. S. Government Printing Office, July 1969.

enrollment in each group.[10/]

Turning to the availabilities of North Carolina workers by educational attainment category in 1970, the first step was to estimate the 1970 educational attainment distribution of the state's entire population. These estimates were obtained by applying trends in educational attainment reported in national surveys throughout the 1960's to the educational attainment distribution of the population is reported in the 1960 Census of Population. Estimates of the 1970 population by age group were obtained from a separate cohort survival population estimation model. Estimates of employment participation rates by age, sex and educational attainment were obtained by adjusting national estimates of labor force participation rates by age, sex, and educational attainment so the total availability of workers in 1970 by educational attainment equaled total requirements.

Unmet training needs in 1970 were obtained by comparing requirements and availabilities estimated in 1970 for each of the educational attainment levels. For this process, it was assumed that one-third of the presently available high school graduates have experienced some form of post-secondary occupational education.

Technical and vocational training needs were set equal to the increase in availabilities required to balance high school post-secondary requirements and availabilities. Next, the availabilities of high school graduates without post-secondary training were decreased to reflect this movement from the high school graduate to the high school post-secondary level of educational attainment.

10/ Source materials used in this process included the following: Descriptions of occupations were obtained from U. S. Department of Labor, Dictionary of Occupational Titles, Volume I, Definitions of Titles, Third Edition, Washington: U. S. Government Printing Office, 1965; curriculum descriptions were obtained from Educational Guide, Raleigh: North Carolina Department of Community Colleges, January 1969; a guide to the matching of curriculums and occupations was obtained from U. S. Department of Labor, Vocational Education and Occupations, Washington: U. S. Government Printing Office, July 1969.

Training needs for 1-3 years of high school to high school graduate were obtained by moving a sufficient number of people from the former category so that total availabilities of high school graduates equaled requirements. Training needs for the remaining educational programs were calculated by successively equating requirements and availabilities at the 1-3 years of high school and 8 years of schooling educational attainment categories. In each case, availabilities of workers moving into the appropriate educational attainment categories were assumed to come from the next lower category.

In calculating the training needs projected to occur over the next decade, the projected 1980 occupational distribution of employment was calculated in a manner identical to that outlined above for 1970.[11/] The ten-year attrition factors were calculated from data provided in Tomorrow's Manpower Needs. Net occupational and geographic mobility were estimated in two stages: (1) the mobility of workers among major occupational groups was projected using the results of national surveys of occupational mobility and (2) geographic mobility was projected using a demographic cohort survival model. Net migration for the 1970-80 decade for each of the planning areas was estimated by computing the 1980 population which would result from the 1970 estimate with only births and deaths and subtracting this figure from the projected 1980 population. The 1980 population totals were estimated by dividing each planning area's projected total employment by projected values of employment participation rates. Estimates of both intrastate and interstate components of the total migration flows were obtained by use of the migration

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11/ Tomorrow's Manpower Needs provides change factors for the fifteen year period 1960-75. These were converted to average annual rates of change which were extrapolated to 1980 to calculate the 1960-80 change factors.

flows were obtained by use of the migration patterns for the 1955-60 period in North Carolina as reported in the 1960 Census of Population. Using the trends reported in the special labor force reports of the Bureau of Labor Statistics, the national educational attainment distribution of each of the 20 occupational groups was projected for 1975, the year chosen to represent the entire decade.

The final step in determining the community college system training needs was to estimate the number of workers who would enter the labor force during the decade with other sources of training. These workers were further classified into two groups: (1) those who would graduate from other public and private schools throughout the state which offer post-secondary technical and vocational training (e.g., private business colleges, private trade schools, two-year terminal degree programs at public and private institutions of higher education) and (2) those who have completed their schooling and are not in the labor force in 1970 but who will either enter or re-enter the labor force during the decade. This size of this second group was estimated by comparing projected total requirements for the decade with the projected number of workers who will complete their schooling and enter the labor force for the first time during the decade. The educational attainment distribution of this group was taken as the estimated distribution of the North Carolina population aged 25 and over in 1970.

D. Training Needs

Total community college system training needs for the planning decade for the technical, vocational, adult high school and adult basic education programs were derived using the manpower directions model outlined in the previous section. The needs are as follows:

Table 2

COMMUNITY COLLEGE SYSTEM TRAINING
NEEDS FOR THE 1970-80 DECADE

Program	Training Needs	
	Number	Percent
Technical	105,800	19
Vocational	77,700	14
Adult High School	213,300	39
Adult Basic Education	157,700	28
TOTAL	554,500	100

Based on recent experience of the community college system, these needs, which are presented above in terms of workers needed for employment, were converted to graduates and enrollees throughout the planning decade.

Enrollments for the remaining programs of the community college system were projected by use of alternative procedures. College transfer enrollments were projected by extrapolating trends in the percentage of total higher education enrollment in North Carolina which is enrolled in the community college system.[12/] Enrollments in the remaining educational programs were also projected by extrapolating recent trends in the enrollment growth of these programs, with no attempt made to specify the "graduates" which should be produced over the next ten years.

12/ A thorough study of college transfer enrollments should consider the costs and benefits in both society and students from the first two years of college training in the community college as well as the four year institutions. However, such a study was beyond the scope of this planning effort and the trend extrapolation technique was substituted.

IV. ALTERNATIVE PLANS

Four alternative plans were proposed to meet the 1970-80 training needs indentified for the community college system. The four alternatives were chosen to give different patterns of emphasis to the goals of the community college system--specifically those related to technical, vocational and adult education programs. It should be pointed out that these are not the only plans that could be specified and that additional alternatives may be developed in the future. However, it was felt that the alternatives provided were sufficient to permit a meaningful evaluation and recommendation of a single plan for adoption.

The first plan calls for meeting all of the community college system's training needs by the end of the planning decade. In order to accomplish this task, a gradual increase in enrollments over the decade, particularly in the adult education programs, is contained in the plan. This gradual trend avoids sudden increases which would be required if the estimated 1970 unmet needs were to be satisfied in one or two years at the beginning of the decade.

The second alternative plan emphasizes the college transfer, technical and vocational programs of the community college system. This plan calls for meeting all of the technical and vocational program training needs and a continuation of current trends in the adult basic education and adult high school programs. This plan will satisfy approximately 23 percent of the adult basic education and approximately 48 percent of the adult high school training needs.

The third plan could in a sense be called the reverse of the second. Plan Three places greater emphasis on meeting the elementary and secondary level educational needs and specifies the continuation of recent trends in

the enrollments in both technical and vocational programs. These enrollment patterns will satisfy approximately 81 percent of the technical and 84 percent of the vocational training needs projected for the decade. The enrollments specified for this alternative will satisfy 75 percent of the adult basic education and adult high school training needs estimated to exist over the planning decade.

The fourth alternative is designed to combine the different emphases of Plans Two and Three. This plan calls for meeting all of the technical and vocational training needs during the decade, 50 percent of the adult basic education and 8 to 10 years of schooling training needs and a continuation of the current trend in the 10 years of schooling to high school completion training program. This combination will satisfy 59 percent of the total adult high school training needs estimated for the planning decade.

Finally the total costs for each of these plans were projected over the decade. These cost projections were based on recent operating experience of the community college system and include an allowance for price increases over the next decade. The costs of the four alternatives over the ten year period are as follows: Plan One -- $1,183 million; Plan Two -- $1,033 million; Plan Three -- $961 million; and Plan Four -- $1,082 million.[13/]

V. EVALUATION OF ALTERNATIVES

Given the training needs of the community college system and the alternative strategies that have been specified to satisfy these needs, the next task of the planning process is to evaluate these strategies and to select

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13/ For comparative purposes, total expenditures for the system for the 1967-68 fiscal year, the latest year for which complete figures were available when the cost projections were being prepared, were approximately $37 million.

a single strategy as "the plan" for the ten year period 1970-80. The selection of criteria for evaluating the alternative strategies to meet the training needs was based on both economic considerations and on the fulfillment of the purpose and goals of the system. The problem of evaluation through the use of economic considerations becomes one of assessing the benefits and costs of training varying numbers of students in the educational programs of the community college system over the planning decade.

A measure which has been employed to guide the allocation of public expenditures in situations similar to this is the internal rate of return, an annual interest rate that equates the present value of a future stream of benefits resulting from an investment with the present value of the cost of that investment. In deciding how to allocate a limited amount of resources among completing alternatives, the rate of return for each can be calculated and ranked in descending order. Investment decisions can then be guided by this ranking, with a decision to invest made as long as the rate of return exceeds that of the next best alternative.

Since education deals with the acquisition of skills and knowledge by people, the investment referred to is an investment in human capital.[14/] In this situation, people and society undertake the costs of education (e.g., tuition costs, public expenditures for higher education, foregone earnings of students while in school) in order to obtain the future returns (e.g., increased earnings, increased tax revenues resulting from these higher earnings, a better-informed electorate).[15/] However, several conceptual problems must

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14/ For a comprehensive review of recent articles on investment in human capital through education, see M. Blaug (ed.) Economics of Education I Baltimore, Maryland: Penguin Books, 1968.

15/ A complete analysis of the allocation of government expenditures using the rate of return approach should include other forms of investment in both human (e.g., health, mobility) and non-human (e.g., environmental control, law enforcement activities) capital as well as expenditures in other sectors of the North Carolina education system (e.g., public schools, higher education). However, such an analysis was beyond the scope of this study.

be considered before the measure can be used as the sole guide to the allocation of educational expenditures. A number of these are briefly discussed below.

The first is to distinguish between the private and social rates of return. The former is calculated by considering the anticipated returns and costs faced by an individual in making a decision to invest in his own human capital. The latter includes, in addition to the private costs and returns, costs and returns to society as a whole. As applied to educational planning by a public agency, it is of course the social rate of return that is relevant.

The direct monetary social benefits of education are usually measured from before-tax earnings differentials due to increased education as a percentage yield on the total private and public costs of education. However, the increased earnings may not necessarily result from increased education, but because of greater abilities of the students who received further education. Furthermore, all of the benefits of education are not received from future flows of increased income, as the consumption benefits must also be included. These benefits refer to the enjoyment of education for its own sake (e.g., the present enjoyment of athletics, student government and social activities while in school).

In addition, a large variety of indirect benefits exist which should be considered in measuring the social rate of return. These include for example: (1) current income gains to persons other than those who received the extra education, (2) income gains to subsequent generations from a better educated present generation, (3) the means of assuring occupational flexibility of the labor force and furnishing skilled manpower requirements of a growing economy, (4) the tendency to encourage lawful behavior and to promote voluntary responsibility for welfare activities, both of which reduce the demand on social services, (5) the tendency to foster political stability by developing

an informed electorate and competent political leadership, and (6) the enhancement of the enjoyment of leisure by widening the intellectual horizons of both the educated and the uneducated.

Each of these should increase the social return to education over that calculated by measuring direct benefits only. However, it is easily recognized that if all these are to be quantified, the use of the concept of rate of return to guide educational planning is defeated at the outset. We must recognize that economics is only part of the story, perhaps a very important part, and continue the search for a methodology for a positive consideration of social returns in the planning effort.[16/]

In applying the rate of return concept to planning for the community college system, the results of this project can be used to estimate and project the costs of providing training in broad program areas--college transfer, technical vocational, adult high school and adult basic education. However, data on the returns to graduates of the system, even direct monetary returns, are simply not available, with the exception of one study noted below.. A possible approach is to estimate returns from earnings profiles reported on a nation-wide basis and costs estimated for the community college system. However, since the estimated earnings profiles of graduates of the system may differ substantially from those of the nation, rates of return estimated by this procedure may not be reliable. For these reasons, it was decided to use the results of calculations of rate of return as computed by others to guide the evaluation of alternative plans for the community college system.

Gary Becker has estimated private rates of return to white males of 14.8 percent for college graduates and 28 percent for high school graduates.[17/]

16/ For a more complete discussion of these problems, see M. Blaug, "The Rate of Return on Investment in Great Britain," The Manchester School, Vol. 33 (1965) No. 3, pp. 205-51

17/ Gary Becker, Human Capital. New York: Columbia University Press, 1964, p. 128.

Lee Hansen has estimated a social rate of return of 11.4 percent for high school graduates and 10.2 percent for college graduates in 1959.[18] Hanoch has estimated the following rates of return for whites and non-whites in the South in 1959.[19]

Race	0-4 to 8 Years of Schooling	8 Years of Schooling to High School Graduate	High School Graduate to 1-3 Years of College	High School Graduate to College Graduate
White	(a)	18.6	9.3	10.1
Non-white	27	11.0	(7.0)	(6.0)

(a) Rate was above 100 (extremely high in most cases). Numbers in parentheses were based on an insufficient number of observations to be reliable.

In each of the sets of estimates, the rate of return is generally higher the lower the level of schooling. However, adjustment of the rates of return for high school graduates for ability may result in a substantial downward revision. Nevertheless, the research cited by these three authors will be used to evaluate alternative plans for the community college system.

Studies of vocational and technical schooling which contain estimates of both costs and returns are relatively scarce. An attempt to estimate both private and social rates of return to training in nine instructional areas at a Minnesota technical school produced a large amount of variation in rates of return. More specifically, private rates of return ranged from 11 to 53 percent, while social rates of return ranged from 9 to 36 percent.[20]

18/ W. Lee Hansen, "Total and Private Rates of Return to Investment in Schooling," Journal of Political Economy, Vol. 81 (1963), No. 2 pp. 128-141.

19/ Giora Hanoch, "An Economic Analysis of Earnings and Schooling," Journal of Human Resources, Vol. II, No. 3, Summer 1967, pp. 310-329.

20/ S. Pejovich and W. Sullivan, The Role of Technical School in Improving the Skills and Earning Capacity of Rural Manpower: A Case Study, Washington: Office of Manpower Policy, Evaluation and Research, U. S. Department of Labor, 1966.

Estimates of private and social rates of return to graduates of Gaston Technical Institute in the North Carolina Community College System are available.[21/] These figures are for graduates during 1959 and 1960 and have been adjusted for the ability of the graduates. The social rate of return was estimated to range from 11.7 to 16.5 percent. Private rates of return, with incomes measured after taxes, ranged from 23 to 25 percent.

Carroll and Ihnen point out that (1) their rates of return may be higher than those estimated by others due to differences in the methodology employed, and (2) the return to technical schooling, as measured by increased earnings, might well be expected, a priori, to be higher than that to four years of college. The latter statement is due to the fact that graduates of a technical curriculum receive specialized training so that more of their course work is oriented to tasks to be performed in a specific occupation or group of occupations, whereas some of the course work of four year college students may be more closely related to consumption. The returns to the former can be estimated from wage information while, as mentioned above, the consumer services which result from schooling cannot be measured directly in the market and are usually omitted in estimating returns.

The single study measuring a rate of return to education in the North Carolina Community College System reported a social rate of return for technical and vocational programs higher than that reported by Hansen in 1959 for a four-year college education and comparable to the four-year college rate of return as reported by Becker. Although the dangers in comparing the rate of return to graduates of Gaston Technical Institute have been discussed, nevertheless the results indicate that the allocation of resources to post-secondary technical and vocational training can be defended on the grounds of economic efficiency.

21/ Adger B. Carroll and Loren A. Ihnen, "Costs and Returns for Two Years of Postsecondary Technical Schooling: A Pilot Study," Journal of Political Economy, Vol. 75, No. 6, pp. 862-873.

There are two readily indentifiable sources of bias in the national rates of return as applied to the adult education programs in the community college system. The reported rates of return, taken from national census data, are based on the assumption that income is earned from age 14 until retirement, with the individual remaining in the same educational attainment category throughout his working life. Adults who graduate from the adult programs in the community college system will have a much shorter time period over which to obtain returns from their investment. Therefore, considering this source of bias, the reported rates of return overstate the rates of return to the adult programs.

On the other hand, it is probable that non-monetary benefits constitute a greater fraction of total benefits for the adult programs than for the technical and vocational programs. To the extent that this is true, the reported rates of return understate the true social rates of return to graduates of the adult programs. In considering these two sources of bias, it is felt that the latter at least offsets the former, thus preserving the relative rankings of the rates of return to various levels of schooling as presented and providing justification for expanded adult programs.

It was assumed that each of the four alternative strategic plans as specified for the system in this effort satisfies the purpose and goals 1, 6, and 7 to the same extent. Therefore in evaluating the alternative plans by the goals of the system it is necessary to determine the extent to which each satisfies the remaining four goals. It was estimated that the four alternative plans satisfy the remaining goals as indicated below:

Goal	Plan 1	Plan 2	Plan 3	Plan 4
2	100%	100%	91%	100%
3	100%	100%	82%	100%
4	100%	68%	83%	77%
5	100%	37%	75%	55%

If each of these four goals were judged of equal importance, the four alternatives could be ranked by summing the percentages of the goals satisfied. This ranking is as follows: Plan 1, Plan 4, Plan 3, Plan 2. However, in the process of choosing among the alternatives, it is recognized that the goals may not be weighted equally. Based on discussions with staff members of the Department of Community Colleges goals 2 and 3 were considered to be of greater importance than goals 4 and 5. This results in the following ranking of the plans based on their evaluation against the weighted ranking of the goals:

1st - Plan 1

2nd - Plan 4

3rd - Plan 2

4th - Plan 3

Based on the costs, rates of return and percentages of goals satisfied by each of the alternatives, the Department of Community Colleges recommended alternative plan one to the State Board of Education for implementation during the next ten years.

VI. RECOMMENDED PLAN

As projected in the recommended strategic plan, total unduplicated headcount enrollment will grow from 240,851 in the 1968-69 academic year to over 783,000 in 1979-80, the last year of the planning decade. The details of this enrollment growth, including projected 1979-80 enrollments in the major educational programs and the projected growth rates for the 11-year period 1968-69 to 1979-80 are contained in the following table.

The implications of the recommended strategic plan for the operations of the community college system during the decade can best be explained in terms of past, present, and future distributions and growth rates of enrollments in the various educational program offerings. During the past two years (1966-67 to 1968-69) total unduplicated headcount enrollment in the system has grown at a 20.4 percent annual rate. During this time period, the distribution of enrollment has changed to some extent, as different programs have been growing at different rates. The share of total enrollment in curriculum programs has increased from 15.5 to 17.5 percent, growing at a 28.0 percent annual rate. The share of adult extension programs has fallen over the past two years, from 24.4 percent of total enrollment in 1966-67 to 17.1 percent of total enrollment in 1968-69. During this period adult basic education enrollment has declined at a 5.2 percent annual rate, while enrollment in the adult high school programs has increased slightly. Finally, during this two-year period, the share of total enrollment in the general adult extension program had increased, growing at a 29.5 percent annual rate.

Table 3

COMMUNITY COLLEGE SYSTEM ENROLLMENT TRENDS
(unduplicated headcount)

Program	1968-69 Enrollment	1968-69 Percent	1979-80 Enrollment	1979-80 Percent	Annual Growth Rate 1968-69 to 1979-80 (percent)
Curriculum					
College Transfer	12,243	5.1	36,500	4.7	10.4
Technical	19,016	7.9	53,700	6.9	9.9
Vocational	10,795	4.5	23,200	3.0	7.2
Total Curriculum	42,054	17.5	113,400	14.5	9.4
Extension					
Adult					
Adult Basic Education	22,542	9.4	150,000	19.1	18.8
Adult High School	18,728	7.7	72,000	9.2	13.0
Total Adult Extension	41,270	17.1	222,000	28.3	16.5
Occupational	86,146	35.8	208,900	26.7	8.4
General Adult	71,381	29.6	239,000	30.5	11.6
Total Other Extension	157,527	65.4	477,900	57.2	10.0
Total Extension	198,797	82.5	669,900	85.5	11.7
GRAND TOTAL	240,851	100.0	783,300	100.0	11.3

Three major conclusions concerning future rates of growth can be drawn from the enrollments recommended in the strategic plan compared with those of the recent past: (1) total enrollment will grow at a slower rate in the future, (2) the rate of growth in adult programs will exceed that experienced over the past two years with the adult basic education program exhibiting the highest growth rate of all programs, and (3) the growth rate in the curriculum program enrollments will be substantially less than that of the past two years.

Large percentage increases in total enrollments have been experienced over the past two years due to the existence of a relatively small base enrollment in 1966-67 and to the fact that some institutions have been assuming full operations during this period. The training needs derived from the North Carolina manpower directions do not indicate any justification for continuing these trends.

VII. ADDITIONAL PLANNING EFFORTS

In order to be useful to local administrators in the preparation of institutional plans, the information presented in the long-range plan must be provided in greater detail required for curriculum planning. A four-year operating plan was designed for this purpose. In this plan, the technical and vocational program training needs for each of the 20 occupational groups of the manpower directions are presented. These needs have been derived for the four years of the plan, 1971-72 through 1974-75, for each of the ten planning areas designated for the overall planning effort. In addition the annual training needs for the adult high school and adult basic education programs are presented for each of the ten planning areas.

Additional information which is required by local administrators in deriving institutional plans is presented in the four-year operating plan. This information includes a detailed listing of specific occupations

included in each of the 20 occupational groups and a listing of technical and vocational curriculums that are presently authorized within the system, tabulated by the occupational group for which they provide graduates.

As shown in the planning process represented in Figure 1, the success of the entire effort depends on effective planning at the local or institutional level as well as at the state level. Efforts are currently underway to design both a planning process and a series of time-phased plans for a single institution in the community college system. These plans are based on data derived during the statewide planning effort, supplemented with the necessary additional inputs from the local level. The results of the local planning effort will be documented for distribution to the remaining 53 institutions in the system to guide their planning efforts. Although movement from the present methods of operation to systematic planning procedures will not be completed immediately, over a period of two to three years it is anticipated that the community college system will adopt planning and budgeting procedures that will enable the 54 institutions to fulfill their role in the rapidly charging North Carolina economy in a more effective and efficient manner.